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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/562,369

07/10/2006

Peter John Hastwell

13004.4

6262

7590 04/03/2008
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EXAMINER

BHAT, NARAYAN KAMESHWAR

ART UNIT

PAPER NUMBER

1634

MAIL DATE

DELIVERY MODE

04/03/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/562,369

Applicant(s)

HASTWELL ET AL.

Examiner

NARAYAN K. BHAT

Art Unit

1634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2008.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33, 51 and 52 is/are pending in the application.
4a) Of the above claim(s) 51 and 52 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-33 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 22 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB08)
Paper No(s)/Mail Date 3/01/2007
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Claims 1-33, 51 and 52 are pending in this application.
2. Applicant's election with traverse of Group I, claims 1-33, in the reply filed on January 4, 2008 is acknowledged. The traversal is on the grounds that both group I, VI and VII define a contribution over the cited prior art. The claims of the instant 371 national stage application were found to lack unity of invention, because the prior art cited teaches a substrate with distinct location capable of forming electrostatic charges on the said location. Therefore, technical feature linking groups I, VI and VII does not constitute a special technical feature and the restriction as indicated in the previous office action is proper and made final.
3. Claims 51 and 52 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on January 4, 2008.
4. Claims 1-33 are under prosecution.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-8 are rejected under 35 U.S.C. 102(a) and 102(e) as being anticipated by McEntee et al (USPGPUB NO 2004/0050701 filed Sep. 13, 2002).

Regarding claim 1, McEntee et al teaches a method of manufacture by micrometer and nanometer scale spatially selective deposition of chemical substances on a substrate, the method including the steps of defining at least one region on the substrate by forming an electrostatic charge on that region which is different from the electrostatic charge on other regions of the substrate (Fig. 2B, # 134, paragraphs 0014, 0043 and 0059-0060, step 'a' of the claim).

McEntee et al teaches applying chemical species in the form of ionized droplets on the differentially charged substrate by converting them to aerosols comprising an emulsion (paragraphs 0041, 0097) that includes an electrically insulative continuous phase (paragraph 0097) and an electrically charged discontinuous phase (paragraphs 0097 and 0098), thus teaching a component to be selectively deposited is carried in (step 'b' of the claim). McEntee et al also teaches directing the discontinuous phase of the emulsion to the at least one region by attraction to or repulsion from the electrostatic charge on the region (paragraph 0098, step 'c' of the claim).

Regarding claim 2, McEntee et al teaches that the component to be selectively deposited is selected from the group comprising a DNA, i.e., a bio-active agent,

chemical or biochemical material, a reagent and biological probes (paragraphs 0033, 0041, 0043 and 0088).

Regarding claim 3, McEntee et al teaches the step of carrying out repetition of steps (a) to (c) as recited in claim 1, to provide a stepwise deposition process at the same or alternative positions on the substrate (paragraph 0108, pg. 17, McEntee et al, claim 39).

Regarding claim 4, McEntee et al teaches a method of manufacture by micrometer and nanometer scale spatially selective deposition of chemical substances on a substrate, the method including the steps of defining at least one region on the substrate by forming an electrostatic charge on that region which is different from the electrostatic charge on other regions of the substrate (Fig. 2B, # 134, paragraphs 0014, 0043 and 0059-0060, step 'a' of the claim).

McEntee et al teaches applying chemical species in the form of ionized droplets on the differentially charged substrate by converting them to aerosols comprising an emulsion (paragraph 0097) that includes an electrically insulative continuous phase (paragraphs 0041, 0097) and an electrically charged discontinuous phase (paragraphs 0097 and 0098), thus teaching a component to be selectively deposited is carried in (step 'b' of the claim). McEntee et al also teaches depositing the discontinuous phase of the emulsion to the at least one region by attraction by the electrostatic charge on the region and optionally by the use of bias voltage to reduce deposition in non-required regions (paragraphs 0098 and 0099, step 'c' of the claim).

McEntee teaches a method for insitu synthesis of DNA and RNA wherein array substrate is exposed to multiple chemical species sequentially thus causing a chemical reaction in the at least one region (paragraph 0188, step'd' of the claim) and further teaches a washing step, i.e., removing the emulsion (paragraph 0188, step 'e' of the claim).

Regarding claim 5, McEntee et al teaches the step of carrying out repetition of steps (a) to (e) as recited in claim 4, to provide a stepwise deposition process at the same or alternative positions on the substrate (paragraph 0108, pg. 17, McEntee et al , claim 39).

Regarding claim 6, McEntee et al teaches the step of flooding further with a reagent wherein reaction of the further reagent only occurs where the spatially selective deposition had previously occurred (paragraph 0108).

Regarding claim 8, McEntee et al teaches a method wherein the step of applying the emulsion to the substrate includes the step of applying a coating of opaque material surrounding the deposition site on the substrate, which is of other liquid before applying the emulsion (Fig. 3, Deposition site # 3, Surrounding area # 136, and paragraph 0073).

Regarding claim 7, McEntee et al teaches a method of manufacture by micrometer and nanometer scale spatially selective deposition of chemical substances on a substrate, the method including the steps of defining at least one region on the substrate by forming an electrostatic charge on that region which is different from the electrostatic charge on other regions of the substrate (Fig. 2B, # 134, paragraphs 0014, 0043 and 0059-0060, step 'a' of the claim).

McEntee et al teaches applying chemical species in the form of ionized droplets on the differentially charged substrate by converting them to aerosols comprising an emulsion (paragraphs 0041, 0097) that includes an electrically insulative continuous phase (paragraph 0097) and an electrically charged discontinuous phase (paragraphs 0097 and 0098), thus teaching a component to be selectively deposited is carried in (step 'b' of the claim). McEntee et al also teaches depositing the discontinuous phase of the emulsion to the at least one region by attraction by the electrostatic charge on the region and optionally by the use of bias voltage to reduce deposition in non-required regions (paragraphs 0098 and 0099, step 'c' of the claim).

McEntee teaches a method for insitu synthesis of DNA and RNA wherein array substrate is exposed to multiple chemical species sequentially thus causing a chemical reaction in the at least one region (paragraph 0188, step'd' of the claim) and further teaches a washing step, i.e., removing the emulsion (paragraph 0188, step 'e' of the claim). McEntee et al further teaches carrying out subsequent steps of the stepwise reaction emulsion (paragraph 0188, step 'f' of the claim, pg. 17, McEntee et al, claim 39).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 9-10, 24-27 and 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over McEntee et al (USPGPUB NO 2004/0050701 filed Sep. 13, 2002) in view of Montgomery (USPN 6,280,595 issued Aug. 28, 2001).

Regarding claim 9, McEntee et al teaches a method of forming a DNA array on a substrate, the method including the steps of preparing a substrate with a surface (Fig. 1, substrate # 110, paragraph 0110) and further teaches defining at least one region on the substrate by forming an electrostatic charge on that region which is different from the electrostatic charge on other regions of the substrate (Fig. 2B, # 134, paragraphs 0014, 0043 and 0059-0060, step 'b' of the claim).

McEntee et al teaches applying chemical species in the form of ionized droplets on the differentially charged substrate by converting them to aerosols comprising an emulsion (paragraphs, 0041 and 0097) that includes an electrically insulative continuous phase (paragraph 0097) and an electrically charged discontinuous phase (paragraphs 0097 and 0098), thus teaching a component to be selectively deposited is

carried in (step 'c' of the claim). McEntee et al also teaches depositing the discontinuous phase of the emulsion to the at least one region by attraction by the electrostatic charge on the region and optionally by the use of bias voltage to reduce deposition in non-required regions (paragraphs 0098 and 0099, step 'd' of the claim).

McEntee teaches a method for insitu synthesis of DNA and RNA wherein array substrate is exposed to multiple chemical species sequentially thus causing a chemical reaction in the at least one region (paragraph 0188), but is silent about causing chemical de-protecting in the at least one region.

McEntee et al further teaches a washing step, i.e., removing the emulsion (paragraph 0188, step 'f' of the claim). McEntee et al further teaches carrying out subsequent steps of the stepwise reaction emulsion (paragraph 0188, step 'g' of the claim, pg. 17, McEntee et al, claim 39).

McEntee et al are silent about surface having a functional group and de-protection step at the site of in-situ synthesis.

Regarding claim 10, McEntee et al teaches insitu oligonucleotide synthesis (paragraph 0043), which comprises the subsequent steps of the stepwise coupling process are those in the phosphoramidite chemistry for synthesis of oligodeoxynucleotides.

Regarding claim 24, McEntee et al teaches the step of defining at least one region on the substrate by forming an electrostatic charge on that region includes the step of image reversal to enable deposition in non-charged regions (paragraphs 0056 and 0106).

Regarding claim 25, McEntee et al teaches the step of formation of the electrostatic image pattern is by electrostatic means wherein the substrate is a photoconductor and the formation of the electrostatic field is by charging and subsequent discharging by selective illumination (paragraph 0010).

Regarding claim 30, McEntee et al teaches that the substrate comprises a support, a conductive layer on the support (Fig. 1, # 120), a photoconductive layer (Fig. 1, #130) of a material which will hold an electric charge and a chemically functional layer (paragraphs 0043, 0084-0087).

Regarding claim 31, McEntee et al teaches that the support is selected from the group comprising polymeric material (paragraph 0087).

Regarding claim 32, McEntee et al teaches that the conductive layer is selected from the group comprising a sputtered layer of metal (paragraph 0042).

Regarding claim 33, McEntee et al teaches that the photoconductor layer is selected from the group comprising zinc oxide, alloys of selenium such as selenium-tellurium (paragraph 0043).

Regarding claim 9, McEntee et al teaches the insitu synthesis of oligonucleotides (paragraphs 0043 and 0108), but is silent about the functional group on the substrate and chemical deprotecting at the deposited site. However, functional groups on the substrate to synthesize polymers and chemical deprotection at the deposited site was known in the art before the claimed invention was made as taught by Montgomery, who teaches a solid phase synthesis method that includes a substrate with surface functional groups protected by a removable protecting group at a addressable electrode

location (Fig. 1a, protectable functional group # L—p, Fig. 1b- after deprotection # L-NH₂, Addressable location -#1, column 5, lines 57-67, step 'a' of said claim) and further teaches applying potential to generate electrochemical reagents capable of deprotecting the protected chemical groups on the molecule (column 5, lines 30-56).

The combined teachings of McEntee et al and Montgomery teach all the limitations of method steps recited in claim 9.

Regarding claim 26, Montgomery teaches scavenging agent to neutralize any residual chemical de-capping agent in the reaction region to prevent it from reacting in non-desired parts of the array.

Regarding claim 27, Montgomery teaches that chemical deprotection agent is sulfonic acid (column 21, lines 5-11).

Montgomery also teaches that the electrochemical technique is well suited for synthesizing a variety of chemical sequences at known locations that is cost effective and practical and saving time (column 4, lines 28-38).

It would have been prima facie obvious to one having the ordinary skill in the art at the time the invention was made to use the electrochemical technique of Montgomery in the DNA array method of McEntee et al with the expected benefit of synthesizing a variety of chemical sequences at known locations that is cost effective and practical and saving time as taught by Montgomery (column 4, lines 28-38).

10. Claims 9, 11-23 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over McEntee et al (USPGPUB NO 2004/0050701 filed Sep. 13, 2002) in

view of Montgomery (USPN 6,280,595 issued Aug. 28, 2001) as applied to claims 4 and 9 above and further in view of Paolini et al (USPGPUBNO. 2002/0131147, published Sep. 19, 2002).

Teachings of McEntee et al in view of Montgomery regarding claim 9 are described in this office action on pages 7-8.

Regarding claims 11-23, McEntee et al in view of Montgomery teaches an emulsion (McEntee et al, paragraph 0097) but is silent about its volume resistivity, viscosity and details of method of producing emulsion. However, production of two phase emulsion and its properties were known in the art before the claimed invention was made as taught by Paolini et al.

Regarding claim 11, Paolini et al teaches a two phase electrophoretic medium that includes a continuous phase emulsion of a volume resistivity of high resistivity of approximately greater than a million ohm-cm (paragraphs 0074 and 0089).

Regarding claim 12, Paolini et al teaches a continuous phase of the emulsion selected from mixture of hydrocarbons, aromatic hydrocarbons, silicone fluids (paragraphs 0020 005, 0076-0077).

Regarding claim 13, Paolini et al teaches the continuous phase of the emulsion is a highly viscous liquid (paragraph 0039).

Regarding claim 14, Paolini et al teaches that two phase electrophoretic medium wherein the discontinuous phase of the emulsion is non-aqueous and is substantially insoluble in the continuous phase (paragraphs 0008 and 0037).

Regarding claim 15, Paolini et al teaches a method wherein the discontinuous phase of the emulsion is selected from the group comprising a carrier liquid for a solid particle (paragraph 0008).

Regarding claim 16, Paolini et al teaches that the discontinuous phase of the emulsion is selected from the group comprising commercially available mixtures of hydrocarbons including Isopar (paragraph 0051).

Regarding claim 17, Paolini et al teaches that the emulsion further includes a charge control agent (paragraphs 0060 and 0084).

Regarding claim 18, Paolini et al teaches that wherein the charge control agent is selected from the group comprising an inorganic acid and its salts, an organic acid and its salts or an ionic or zwitterionic compound (paragraphs 0084-0089).

Regarding claim 19, Paolini et al teaches that wherein the charge control agent is selected from the group comprising metallic soaps, comprising a metal and an acid wherein the metal is selected from barium, calcium, zinc, chromium, aluminum, lead, manganese, iron, nickel and cobalt and the acid portion is a carboxylic acids, caproic acid, octanoic (caprylic) acid, capric acid, lauric acid, stearic acid, oleic acid, linolic acid (paragraph 0088).

Regarding claim 20, Paolini et al teaches that the emulsion comprises the discontinuous phase present in the range of about 40 to 95 % and continuous phase surrounds the discontinuous phase (paragraphs 0018-0019) thus teaching continuous phase is in the claimed range. Paolini et al also teaches that emulsion comprises surfactant 0.1 to 10% by weight (paragraph 0041) and charge control reagent

(paragraphs 0083-0088). Paolini also teaches surfactant is also comprise charge control agent (paragraph 0088) thus teaching charge control agent is within the claimed range of percent by weight.

Regarding claims 21-23, Paolini et al teaches that the discontinuous phase has a droplet size of from about 1 nm to 100 microns (paragraphs 0046, 0054 and 0067), which meets the limitation of droplet size from 100 microns down to 0.2 microns (limitation of claim 21), from 500 nanometers down to about 50 nanometers (limitation of claim 22) and from about 200 nanometers down to 1 nanometer (limitation of claim 23).

Regarding claim 28, Paolini et al teaches that the emulsion further includes a surfactant, the surfactant having a first part which is compatible with the continuous phase and a second part which is compatible with the discontinuous phase, the surfactant being selected to not significantly reduce the volume resistivity of the continuous phase (paragraph 0041).

Regarding claim 29, Paolini et al teaches that the surfactant is selected from the group comprising anionic, cationic, non-ionic or amphoteric compounds, polymer surfactant materials or phospholipids (paragraph 0041).

Paolini et al also teaches that two phase emulsion medium requires reduced processing time in hours rather than in days and also forms an electrophoretic medium of different thickness allowing lowered operating voltage and/or switching time (paragraphs 0048-0049).

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It would have been prima facie obvious to one having the ordinary skill in the art at the time the invention was made to use the emulsion of Paolini et al in the DNA array method of McEntee et al and Montgomery with the expected benefit of having two phase emulsion medium requiring reduced processing time in hours rather than in days and forming an electrophoretic medium of different thickness allowing lowered operating voltage and/or switching time as taught by Paolini et al (paragraphs 0048-0049), thus also providing a detailed method of producing emulsion in hours in the method of McEntee et al and Montgomery.

Conclusion

11. No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Narayan K. Bhat whose telephone number is (571)-272-5540. The examiner can normally be reached on 8.30 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram R. Shukla can be reached on (571)-272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Narayan K. Bhat/

Examiner, Art Unit 1634

Narayan K. Bhat Ph. D.

/Ram R. Shukla/

Supervisory Patent Examiner, Art Unit 1634

